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FORT UNION COAL REGION

NORTH BEULAH TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

MERCER COUNTY, NORTH DAKOTA

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September 1981

Michael J. Penfold
State Director

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INTRODUCTION

The purpose of this action is to offer 6.4 million tons of federal strippable coal reserves that can be further considered for coal leasing and development to help prevent a bypass of federal coal and help meet the energy needs of the Nation.

This site-specific environmental analysis has been prepared for the North Beulah tract (Map 1) in accordance with federal regulations (43 CFR 3420). Similar analyses have been written for other tracts of federal coal being considered for possible leasing in the Fort Union Coal Region. These documents will be used by the regional coal team in determining which tracts to recommend for leasing in 1983.

BACKGROUND

In September of 1980, the Dickinson District Bureau of Land Management (BLM) Office adopted the West-Central Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark and Dunn counties, and a small part of Billings County, North Dakota. The land use planning process included identification of high and moderate potential coal areas, applyication of unsuitability criteria, identification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration for new competitive leasing, lease exchanges, and lease modifications.

Following land use planning, the BLM requested expressions of interest from industry. These expressions, along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

BLM Dickinson Ddistrict staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. Among other things, some of the unsuitability criteria were further considered. New findings are reflected in this report.

Information from this and other site-specific analyses will be used in the Regional Environmental Impact Statement (EIS). The EIS will analyze the site-specific and regional cumulative effects of coal development. In the EIS different combinations of tracts (alternatives) will be considered.

After reviewing the analytical documents, public comments, and the recommendations of the Regional Coal Team, the Secretary of the Interior will select specific tracts for the lease sale. The successful lessee will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

Tracts in the Fort Union Region are being considered for leasing in accordance with the Federal Coal Management Program adopted by the Secretary of the Interior in June 1979. The basis for the program was, in part, the Final Environmental Statement, Federal Coal Management Program. Implementation procedures are contained in Federal Regulations (43 CFR 3400). Authorizing actions are the Mineral Leasing Act of 1920, as amended; the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Orgnization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; and federal regulations concerning federal coal leasing and development, including 43 CFR 3400, 30 CFR 211, and 30 CFR 700-899.

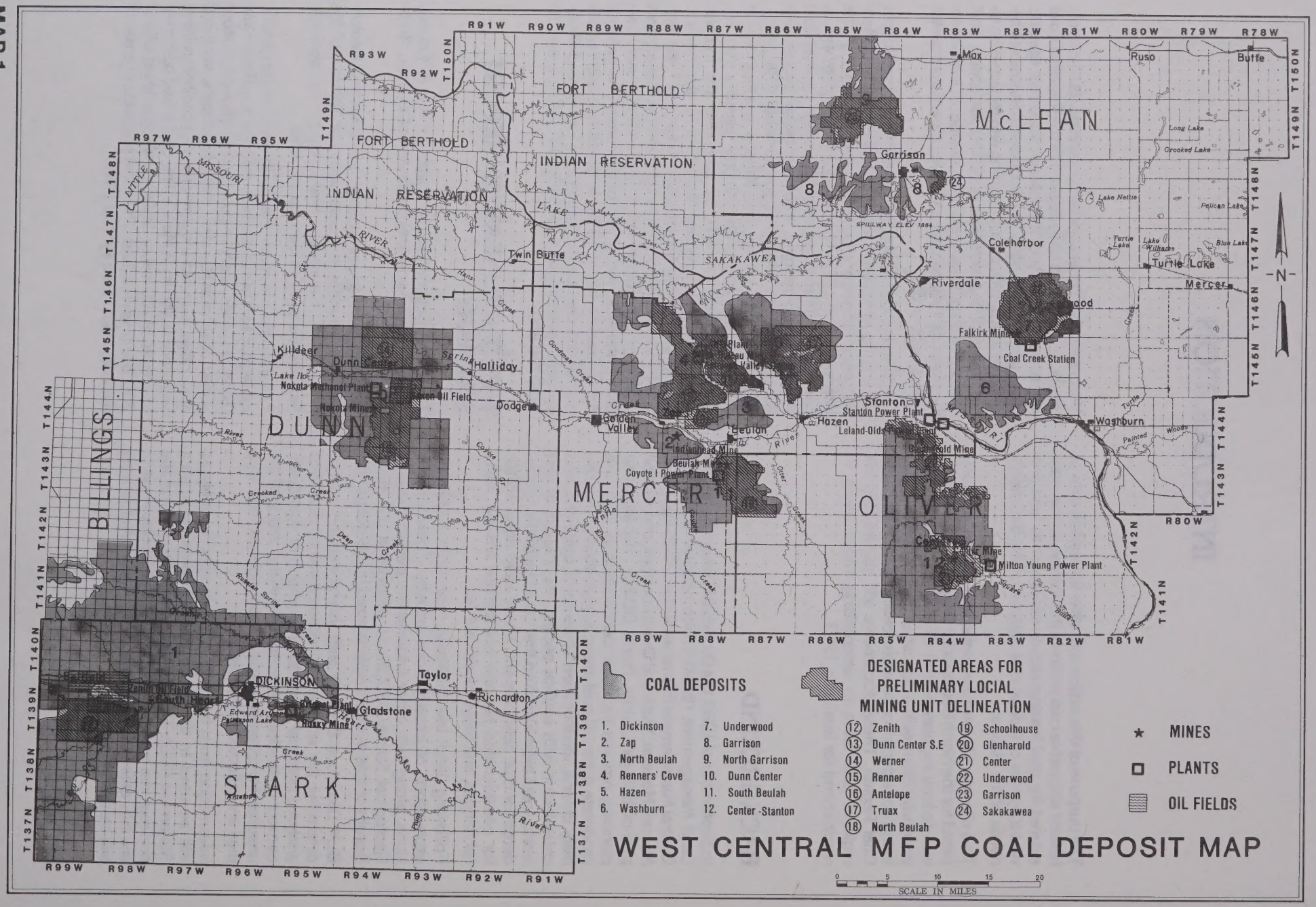
TRACT DELINEATION REPORT SUMMARY

The North Beulah tract is located in Mercer County, North Dakota, two miles northwest of Beulah, North Dakota (Map 1).

The tract is based primarily on the Hazen and Beulah-Zap beds found in the Sentinel Butte Member of the Fort Union Formation (Paleocene). No geologic hazards are know to exist on this tract.

For analytical purposes, the USGS developed a generic mine plan for the tract, which calls for a surface mine using draglines, electric coal loading shovels, bottom dump coal haulers, rotary drills, bulldozers, scrapers, and other support equipment. A possible mining sequence is shown in Map 2. The coal would be mined to a depth of 200 feet or until the limiting striping ratio of 20:1 has been reached. The most probable end-use of the coal would be a synfuel plant.

MAP 1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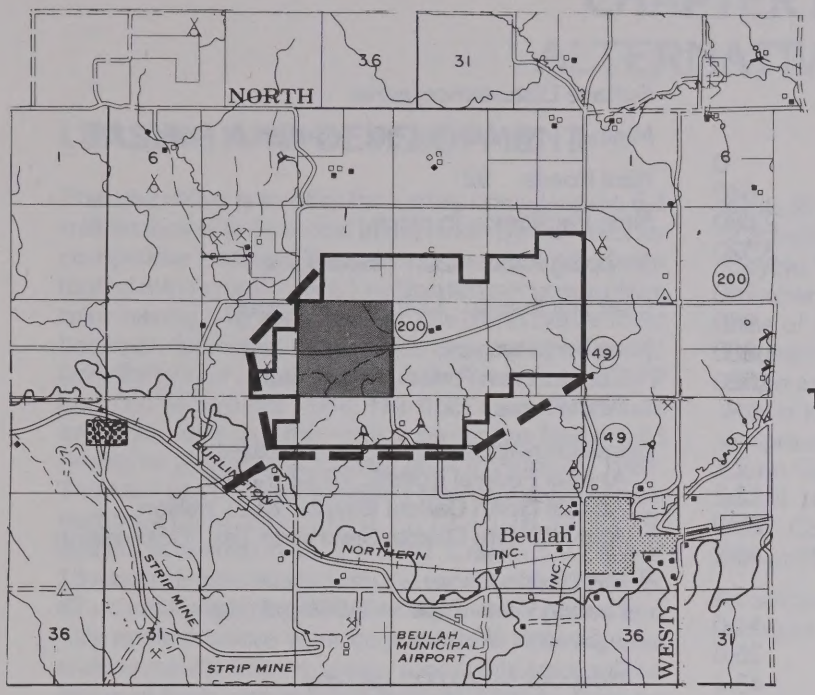
R93W R92W T150N
T149N
FORT BERTHOLD
INDIAN RESERVATION
McLEAN
Max
Ruso
Butte
Garrison
Coleharbor
Riverdale
Falkirk Mine
Coal Creek Station
Turtle Lake
Mercer
Killdeer
Dunn Center
Halliday
Dodge
Golden Valley
Stanton
Stanton Power Plant
Hazen
Beulah
Indianhead Mine
Beulah Mine
Coyote I Power Plant
Washburn
DUNN
MERCER
OLIVER
BILLINGS
STARK
DICKINSON
Taylor
Richardton
Gladstone
Husky Mine
Zenith Oil Field
South Heart
Milton Young Power Plant
R99W R98W R97W R96W R95W R94W R93W R92W R91W
R89W R88W R87W R86W R85W R84W R83W R82W R81W
R80W
T145N T146N T147N T148N T149N T150N
T143N T144N
T141N T142N
T137N T138N T139N T140N
N
COAL DEPOSITS
DESIGNATED AREAS FOR PRELIMINARY LOCIAL MINING UNIT DELINEATION
1. Dickinson
2. Zap
3. North Beulah
4. Renners' Cove
5. Hazen
6. Washburn
7. Underwood
8. Garrison
9. North Garrison
10. Dunn Center
11. South Beulah
12. Center -Stanton
(12) Zenith
(13) Dunn Center S.E
(14) Werner
(15) Renner
(16) Antelope
(17) Truax
(18) North Beulah
(19) Schoolhouse
(20) Glenharold
(21) Center
(22) Underwood
(23) Garrison
(24) Sakakawea
MINES
PLANTS
OIL FIELDS
WEST CENTRAL MFP COAL DEPOSIT MAP
0 5 10 15 20
SCALE IN MILES

NORTH BEULAH TRACT



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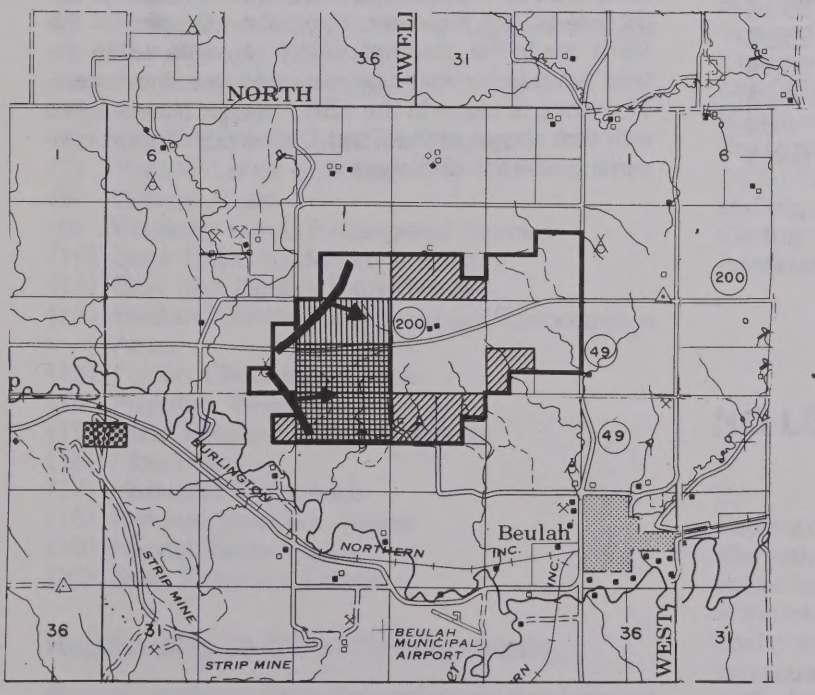
SURFACE OWNERSHIP

LEGEND

- State Surface
- Private Surface
- Tract Boundary
- Federal Coal
- State Coal
- Private Coal
- Leased State Coal
- Surface Facilities
- Out-of-Pit Haul Roads
- Pit Advancement



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SUBSURFACE OWNERSHIP

-N-

1 0 1 2 3 4 5 6

Scale In Miles

MAP 2

Specific Tract Characteristics:

Acreage:

Surface:	Federal	0
	State	640
	Private	2,880
	Total:	3,520
Coal:	Federal	760
	State	960
	Private	1,800
	Total	3,520

Coal Reserves/Millions of Tons:

In Place:	Federal	7.1
	State	12.2
	Private	28.9
	Total	48.2
Recoverable:	Federal	6.4
	State	11.0
	Private	26.0
	Total:	43.4

Bypassed Federal Coal:

Total Acres	760
In Place Reserves	7.1 million tons
Recoverable Reserves	6.4 million tons

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	36.1%
Volatile matter	25.3%
Fixed carbon	30.5%
Ash	6.2%
Sulfur	0.8%
BTU's/lb	6,919

Surface Disturbance/acres

Mining: Annual rate, 58; Total Life of Mine, 2,320

Haul Roads: 92

Mine Facilities: In place.

Stripping Ratio: 20:1 (maximum)

Coal Thickness: 11.9 feet (average(

Mine Employment:
Construction Phase - Mine is built
Peak Phase - 70

Annual Royalties and Severance Taxes:
Annual Federal Royalty, $0.12 million
Annual North Dakota Royalty, $0.21 million
Annual North Dakota Severance Tax, $0.99 million

Water Needs:
Human Consumption, 2,000 gal./day
Source: Well water

Nonpotable, 20,000 gal./day
Source: Pit dewatering

For more specific information on the proposed mining operation refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the Resource Specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

The alternative is to offer for further consideration 6.4 million tons of federal coal in the North Beulah tract for competitive leasing. This tract has been identified, as a logical mining unit for a 1.1 million ton per year surface mine having a 40 year mine life. The North Beulah tract has been delineated within areas designated as acceptable for further consideration in the West Central MFP adopted September 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to April 28, 1981. The tract has been fully cleared of unsuitability criteria numbers 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 16, 17, 18, 19, and 20, as defined in 43 CFR 3461. Criteria 3, 9, 14, and 15 require further study. With the exception of criteria 3, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact study; if not, this tract will be dropped from further consideration. Criteria 3 will be deferred until mining and reclamation plans are submitted to the Office of Surface Mining and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

Mercer County is a center for coal energy development in North Dakota. The North American Coal Corporation was the only company that expressed a specific leasing interest in the North Beulah Coal Deposit. Their Indian Head Mine two miles southwest of the tract, supplies 1.2 million tons to the Stanton Power Plant. Knife River's Beulah Mine, 5 miles southeast, produces 2.2 million tons of coal for the recently constructed Coyote #1 Power Plant. Consolidation Coal Company's Glenharold Mine, 30 miles east, supplies 3.8 million tons of coal annually to the Leland Olds Power Plant. Baukol Noonon Inc.'s Center Mine, 25 miles southeast of the area, produces 4.1 million tons annually for the Milton R. Young Power Plant. The Nokota Company proposes a mine and indirect liquefaction plant near Dunn Center. Coteau Properties will eventually supply about 14.6 million tons annually for the mine mouth ANG Coal Gasification Plant and the Antelope Valley Power Plant installations about 12 miles to the north.

In addition, farming and ranching are also significant activities in and near the area.

Mitigation Measures

This alternative assumes that proper mining and reclamation will be carried out according to existing state and federal regulations. These include: OSM Reclamation and Enforcement Regulations (30 CFR 700-899), Environmental Protection Agency (EPA) regulations (40 CFR 0-1399), Council of Environmental Quality (CEQ) regulations (40 CFR 211), Department of Interior's coal management regulations (43 CFR 23 and 3400), North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).

NO LEASING ALTERNATIVE

Federal coal would not be offered for leasing under this alternative. The tract contains 6.4 million tons of recoverable federal coal which represents about 15 percent of the total recoverable reserves. The amount of federal coal in the tract about 14 percent, is minimal and the individual parcels are scattered. A mine could operate on the tract without the federal coal. If the federal coal is not mined it would probably be bypassed. This alternative would only negatively impact the coal resource and potential state and federal revenues, for other resources, the prevailing trends in the environment would continue.

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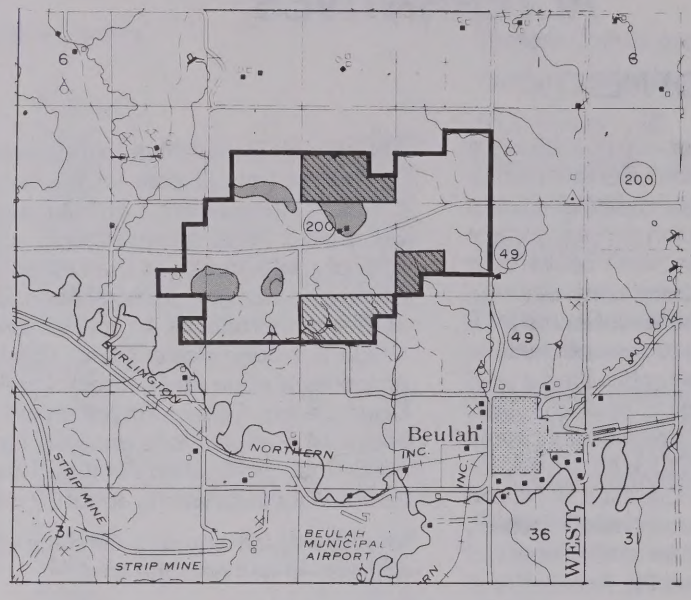
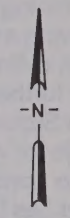




1 0 1 2 3 4 5 6

Scale In Miles

NORTH BEULAH TRACT

LEGEND

Federal Coal

Areas being considered as unsuitable by BLM and others based on existing information.

Wildlife Habitat

Note: Detailed maps are available for inspection at the Dickinson BLM District Office. (Rights-of-way too numerous to show.)

MAP 3

CHAPTER II
AFFECTED ENVIRONMENT

This section is a description of the current environment with anticipated changes from ongoing trends. Within the Williston Basin there has been an increase in oil and gas exploration and this trend is expected to continue. The physical resources described in this section represent only existing conditions while the social and economic sections account for existing conditions and ongoing trends. It is recognized that the physical resource values may change due to future oil and gas exploration.

TOPOGRAPHY

This area lies within the glaciated Missouri Plateau section of the Great Plains physiographic province. Glacial debris are thin or absent and relief in the area is largely erosional. Relatively soft siltstone, sandstone, and claystone layers have been dissected locally to provide badland topography; but more commonly, smooth slopes are found between benches, resulting in a rolling to hilly topography. Maximum relief averages about 100 feet in the area. The area is drained by the Knife River and its tributaries.

GEOLOGY AND MINERALS

This tract is underlain by the Sentinel Butte Member of the Paleocene Fort Union Formation. In this area the Sentinel Butte is about 500 feet thick and consists of yellow-brown to gray, fine to medium grained sandstone, interbedded gray and brown clay and siltstone, gray bentonitic clay beds, and lignite beds.

The Beulah-Zap bed is the only economically mineable bed in the tract and averages 11.9 feet thick. Total tonnage is approximately 48.2 million tons, of which about 7.1 million tons, or 14.7 percent, federal; 30.4 million tons, or 63.0 percent, fee; and about 10.7 million tons, or 22.2 percent, state owned.

No producing oil wells are located anywhere near the tract. Seismic companies are active in the general area. Apparently the potential for oil and gas at this tract is low.

No geologic hazards are known to occur.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

Most of the soils in the North Beulah tract have formed in a thin mantle of glacial till (Williams, Zahl) and from residual shale and sandstone (Cabba, Cohagen). A few have formed in windblown silts and sands overlying the glacial till (Flaxton). There are also some scattered areas of soils developed in alluvium (Straw, Arnegard) and baked clays (Ringling).

The Williams soil mapping units generally occupy the rather gently sloping uplands through the center of the tract. They are deep, well drained, loamy soils of medium to high fertility.

The Cabba, Cohagen, and Ringling mapping units dominate the strongly to steeply sloping breaks into drainage ways coming off both sides of the gently sloping upland mentioned above. They are shallow, well drained, loamy and coarse-loamy soils of low natural fertility.

The water erosion hazard is high over much of this tract because of the extensive steep slopes. The wind erosion hazard is not as serious a threat as from water because of the predominance of loamy surface textures.

The quality of soil within the tract is reflected in the soil suitability for final cover of surface mined land ratings and acreage figures for the SCS Order II county soil survey mapping units in the tract (Tables 1 and 2). By planimetering the soil mapping units according to their rating, it was determined that about 1,287 acres, or 37 percent, is in the "good" suitability category, 1,761 acres, or 50 percent, is "fair," and 472 acres, or 13 percent, is "poor." The Williams mapping units comprise most of the acreage rated "good;" the acreage rated "fair" is dominated by the Cabba, Cohagen units, and the Ringling Unit makes up most of the "poor."

The suitability data in Table 2 is presented by surface landowners because North Dakota law does not allow the transfer of soil material from one landowner to another unless written consent is given. Each surface owner's land must be reclaimed with soil originally removed from his respective holdings. The table therefore indicates the degree of difficulty to reclaim individual landowners holdings based on soil suitability as plant growth material on surface-mined land.

TABLE 1
NORTH BEULAH TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
5 - Dimmick silty clay	0-1	Low	Low	Poor	Too clayey
8B - Grail silty clay loam	3-6	Low	Mod	Fair	Too clayey
8C - Grail silty clay loam	6-9	Low	Mod-High	Fair	Too clayey
9B - Regent silty clay loam	3-6	Low	Mod	Fair	Too clayey
15 - Lawther silty clay	1-3	Low	Low	Poor	Too clayey
28B - Temvik-Williams silt loams	3-6	Low	Low-Mod	Good	----
35C - Amor-Werner loams	6-9	Low-Mod	Mod	Good	----
35D - Amor-Werner loams	9-15	Low-Mod	High	Good	----
36 - Williams loam	1-3	Low	Low	Good	----
36B - Williams loam	3-6	Low	Low	Good	----
36C - Williams loam	6-9	Low	Mod	Good	----
38C - Williams-Zahl loam	6-9	Low-Mod	Mod	Good	----
38D - Zahl-Williams loam	9-15	Low-Mod	High	Fair	Too clayey; some lime
40 - Shambo loam	1-3	Low	Low-Mod	Good	----

TABLE 1
NORTH BEULAH TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
44B - Arnegard loam	3-6	Low	Mod	Good	----
58B - Flaxton-Williams complex	3-6	Mod-High	Low	Good	----
58C - Flaxton-Williams complex	6-9	Mod-High	Mod	Good	----
58D - Flaxton-Williams complex	9-15	Mod-High	High	Good	----
59B - Parshall fine sandy loam	1-6	High	Low	Good	----
71C - Searing-Ringling loams	6-9	Mod	Mod	Fair	Ringling-excess rock fragments, droughty
74B - Regent-Rhoades complex	1-6	Low	Low-Mod	Fair	Too clayey; Rhoades-excess sodium & salts
74C - Regent-Rhoades complex	6-9	Low	Mod-High	Fair	Too clayey; Rhoades-excess sodium & salts
75B - Belfield-Daglum silt loams	3-6	Mod	Mod	Fair	Clayey subsoil; some sodium and salts
79C - Moreau silty clay	6-9	High	High	Poor	Too clayey; excess sodium
81D - Cabba loam	9-15	Mod	High	Fair	Too alkaline; some lime

TABLE 1
NORTH BEULAH TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
81E - Cabba loam	15-35	Mod	High	Fair	Too alkaline; some lime
83E - Cohagen-Vebar fine sandy loam	9-35	High	High	Fair	Cohagen-too alkaline
85 - Harriet Variant silt loam	0-1	Mod	Low	Poor	Excess sodium & salts
87C - Rhoades-Daglum complex	1-9	Low	Mod	Poor	Too clayey; excess sodium & salts
90C - Williams loam - mine sink	1-9	Low	Mod-High	Poor	Danger of collapse
91 - Straw loam	0-3	Low	High	Good	----
97C - Sen silt loam	6-9	Low	High	Good	----
98E - Ringling-Cabba complex	9-35	Mod	High	Poor	Ringling-excess rock fragments; Cabba-too alkaline, some lime
102 - Bowbells loam	1-3	Low	Low	Good	----

1/ From "Soil Survey of Mercer County, North Dakota"

2/ Derived by applying the properties of the soils which are described in the above mentioned soil survey report and "Official Soil Series Descriptions" to the guidelines developed by BLM-Montana State Office and adapted from information by WM Schafer, the Soil Conservation Service (SCS) and the Office of Surface Mining (OSM).

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY LANDOWNER IN THE NORTH BEULAH TRACT

LANDOWNER NUMBER	ACRES GOOD	FAIR	POOR	TOTAL
1	229	256	75	560
2	19	130	49	120
3	73	130	37	240
6	288	218	14	520
7	356	379	65	800
8	42	75	43	160
9	9	14	17	40
10	76	225	99	400
12	182	390	68	640
13	13	22	5	40
TOTALS	1,287	1,761	472	3,520
% OF TOTAL	37%	50%	15%	100%

1/ Based on Table 1. Planimetry by BLM. Legal description of land and owner name corresponding to landowner number avilable at Dickinson District Office.

HYDROLOGY

This tract lies at the top of a small topographic high area between the Spring Creek Valley to the south and a buried glacial meltwater channel to the north. Surface water runoff drains through ephemeral creeks on the tract, mostly to Spring Creek, and some into the fill of the buried glacial valley. Annual runoff here averages about one inch.

No surface water quality data is available for this tract, but for this general area it is typically a sodium sulfate type. The only surface water use within the affected area is stock water ponds.

The three mineable lignite beds in this tract all outcrop along Spring Creek, Knife River and the glacial valley to the north. This limits recharge potential and drains these lignite beds to the point where they do not contain significant amounts of water.

Groundwater is used in the tract for domestic and stock water purposes. All of the water wells in the tract are finished below the Beulah Zap lignite bed, usually in deeper lignite or sand of the Sentinel Butte or Tongue River formations.

VEGETATION AND AGRICULTURAL PRODUCTION

The North Beulah tract is extensively used for agricultural purposes. Acreages and average annual production are shown in Table 3. Dryland farming methods, most notably alternate year summer fallow-cropping rotations, are widely practiced in the area. Eight percent or 287 acres is fallowed each year.

TABLE 3
AGRICULTURAL LAND USE
ON THE NORTH BEULAH TRACT

Land Use:	Tract Acres	Average Production Per Acre 1/	Total Annual Production
Cropland	362	25 bu.	9,050 bu.
Hayland	118	1.35 tons	159 tons
Range	2,656	.5 AUMs	1,328 AUMs
Other	52	1.35 tons	70 tons
Fallow	287	n/a	n/a
Total	3,475	n/a	n/a

1/ Crop : wheat equivalent bu./acre
Hayland: tons/acre
Range : AUMs/acre
Other : tons/acre equivalent.

Small grains such as spring wheat, oats, corn, barley, winter wheat, durum, flax, and sunflowers are grown on 10 percent (362 acres) of the tract. Wheat yields average 25 bushels per acre. Much of the area's cropland production, especially the wheat portion, is sold as a cash crop. Oats, barley, and corn also are used as feed grains in livestock operations.

Three percent (118 acres) of the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.35 tons of hay are produced per acre.

Seventy-seven percent (2,656 acres) is rangeland and pastureland. Rangeland produces about .5 AUM's per acre. An Animal Unit Month, AUM, is the amount of forage needed to support a cow/calf for one month. Beef cattle are the predominant kind of livestock in the area (North Dakota Crop and Livestock Reporting Service, 1980). There are also some dairy cattle, hogs, and sheep.

There are approximately 20 acres of shelterbelts, field windbreaks, and farmsteads per operation. There are several woody draws in the tract which are populated by native trees and shrubs.

Except for reseeded rangeland, the rangeland is in the widespread Mixed Grass Prairie type (Shaver, 1977). This includes species such as needle-and-thread, little bluestem, prairie sandreed, western wheatgrass, blue grama, side-oats grama, plainsmuhly, sedges, snowberry, fringed sagewort, and silver sage.

No threatened or endangered plant species have been identified in the tract.

There are 7 operators and operator partnerships in the tract (Table 4). Operations range in size from 40 acres to 775 acres inside the tract and from 847 acres to 3,624 acres in total. Agriculture in the area includes crop operations, livestock operations, and mixtures of both. Most operations in the area include a balance

TABLE 4

FARM/RANCH OPERATIONS - NORTH BEULAH TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
1	102	23	241	102	52	520	100	440	291	1360	440	219	2740	3260	16
2	34	11	614	21	---	680	82	605	195	1412	246	---	2458	3138	22
3	121	42	504	108	---	775	0	432	18	407	126	17	983	1758	44
4	64	13	592	31	---	720	67	838	154	1512	400	---	2904	3624	20
5	27	29	527	17	---	600	33	299	6	295	207	---	807	1407	43
6	14	0	18	8	---	40	0	282	108	951	151	---	1492	1532	3
7	0	0	160	0	---	160	0	158	92	383	54	---	687	847	19
TOTAL	362	118	2656	287	52	3495	51	3054	864	6320	1624	236	12,071	15,566	22

between crops and livestock. Seventy-one percent of the operations have less than 30 percent of their lands within the tract. No operation has more than 44 percent of its acreage within the tract. Overall, the tract covers 22 percent of the acreage of the operations involved.

Fifty-one percent of the acreage within the tract is farmed by operators who do not own the land. Forty-nine percent is farmed by owner/operators.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The North Beulah tract is two miles northwest of the town of Beulah, population 2,878, the major population center of the locality. The primary existing land use is livestock grazing and pasture, as described in the vegetation and agricultural production section of the document.

The tract is approximately bisected by State Highway 200 and includes some minor roads and local power service.

The region and the local area has active coal mining and evidence of abandoned, often unreclaimed, strip and underground coal mining.

RECREATION

Hunting of a variety of species (deer, upland gamebirds, waterfowl) is the only recreational opportunity offered to the public on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The communities of Zap and Beulah, North Dakota offer recreational opportunities in the vicinity of the tract. Ballfields, playgrounds, parks and gymnasium facilities, along with a swimming pool, offer opportunities judged adequate by community leaders at this time. Lake Sakakawea, north of the tract, offers state and federal recreational opportunities.

AESTHETICS

The North Beulah tract is largely badlands and breaks (broken ground). Steep topography and intricate erosional forms make the area interesting and may be considered to have scenic value, particularly to individuals passing through the area. Agricultural activity takes place on about 10 percent of the tract and is not visually dominant but serves more as an accent within this area of rugged topography. Though this type of landscape is common in the region it, nonetheless, attracts attention because of the variety of land and erosional pattern forms.

Virtually the entire tract is visible from State Highway 200 which approximately bisects the tract along an east/west axis. About one-third to one-half of the tract also is visible from highway 49 which runs along the east edge of the tract. The south slopes of the tract are visible from Beulah, the largest population center in the vicinity.

Coal mining is an existing and well established use in the area and, as such, the visual characteristics of strip mining are accepted by the local population. Whereas, the aesthetic quality of coal mining can be considered poor, these marks on the landscape are not unexpected.

WILDLIFE

Native prairie dominates the ecosystems of this coal tract at 65 percent of the 3,520 acre area, with agriculturally disturbed land comprizing 28.5 percent, native woodlands at 4.5 percent, and wetlands at 2 percent.

The three essential habitats constitute 71 percent of the area. However, not all of the native prairie in this area is essential habitat for sensitive wildlife due to long-term and constant livestock grazing.

Woodlands, wetlands, and native prairie provide essential habitat for 31 sensitive species throughout the biological year. The whooping crane, an endangered species, migrates through this area and uses the regional wetlands (Table 5). This area is glaciated and farming has encompassed all but remnant areas which now support the majority of the best wildlife habitat. The interspersion of essential habitats provides the greatest amount of edge, has the highest wildlife diversity, and largest wildlife populations.

Wetlands, specifically prairie potholes, are the most productive wildlife habitat in North Dakota.

Remaining native grasslands represent precious relics of the original prairie ecosystem. The rate of native prairie loss in North Dakota has been tremendous, and unplowed prairie is only 20 percent of the original total.

There are no sensitive fish, amphibians, or reptiles identified in this area There are sensitive fish in the Missouri River and Knife River downstream of the area. The Lake Chub is one sensitive fish found in the Knife River.

TABLE 5
WILDLIFE HABITAT AND SPECIES

Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

CULTURAL RESOURCES

Historic and prehistoric cultural resources have been recorded from the tract.

One hundred percent of the surface of the tract has been intensively inventoried for cultural resources. This inventory has produced habitation sites as well as open plains task specific and exploitative sites. (i.e. bison kill sites; lithic scatters of varying size, density, and function; and seasonal and long-term habitation sites).

The rolling plains between the Knife and Missouri Rivers is an ideal location for the short-term occupations that are seen in the cultural resources from the tract. Short trips to exploit a variety of resources from the area is seen in the pattern of prehistoric resources that have been recorded. It is likely that this pattern will continue in the future. Also, it is not likely that resources recorded in the future will prevent coal mining, as is the case for those already recorded.

In the historic period, the dominant human activity in the area has been farming. While some stock raising has also taken place, most cultural manifestations are related to farming. This activity may also be responsible for the destruction of cultural resources.

ECONOMICS AND SOCIAL CONDITIONS

Existing and forecasted population and employment levels for the communitites of Beulah, Hazen, Zap, Bismarck, and Mandan, North Dakota are shown in Figure 1 (Mountain West 1981). As can be seen from this figure, future population levels without federal coal leasing show considerable fluctuations through the early 1990's due to the construction of energy projects not directly related to the leasing of federal coal.

FIGURE 1

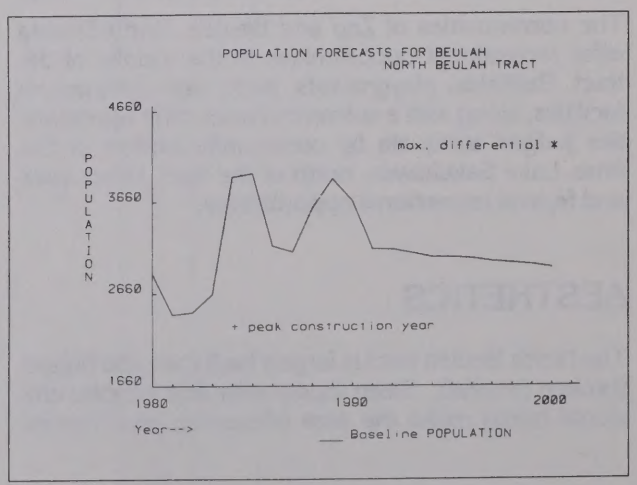
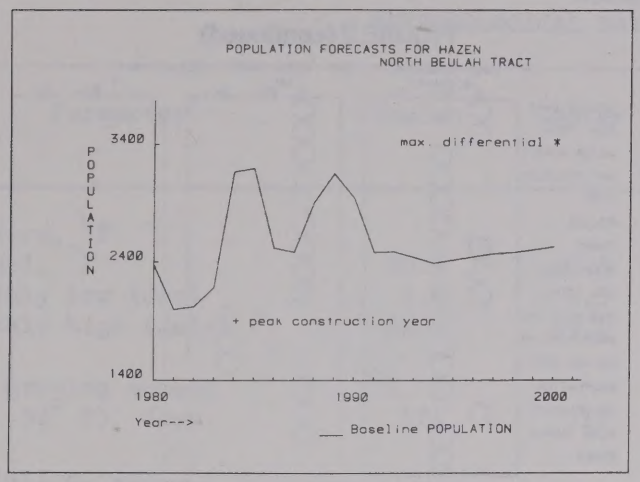
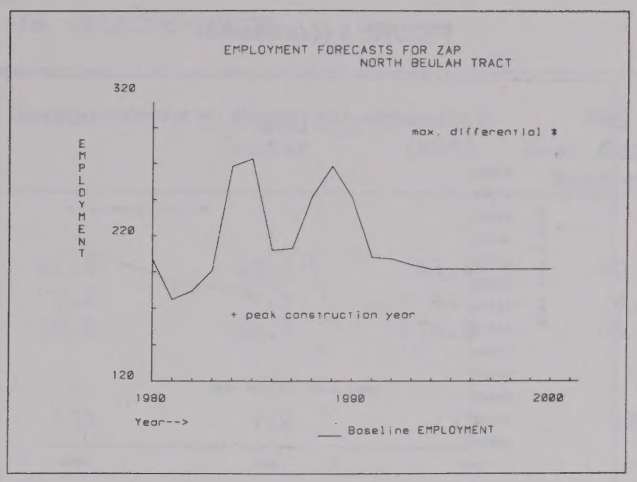
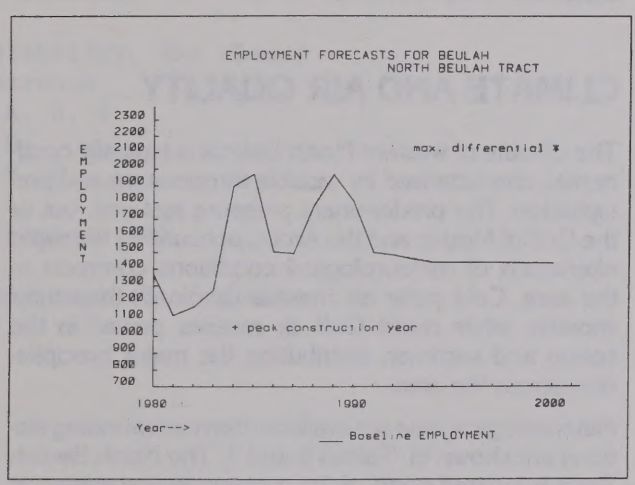
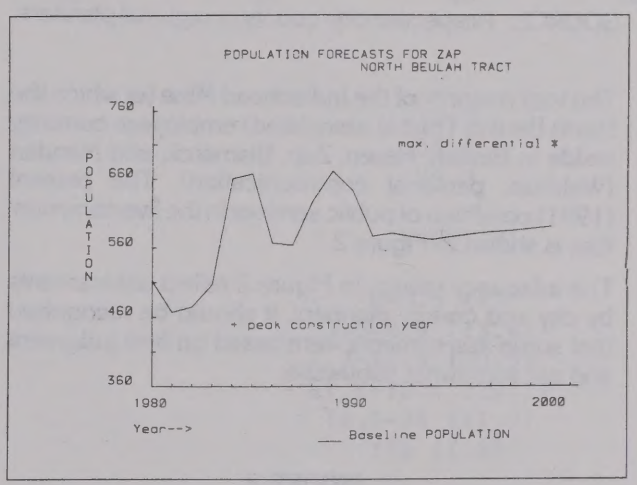


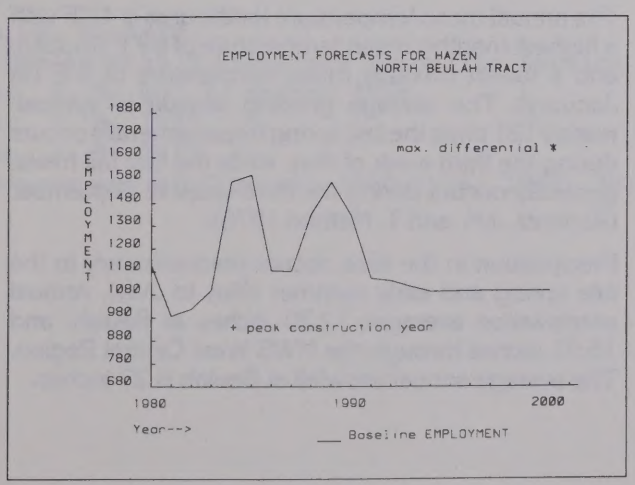
FIGURE 1 (continued)











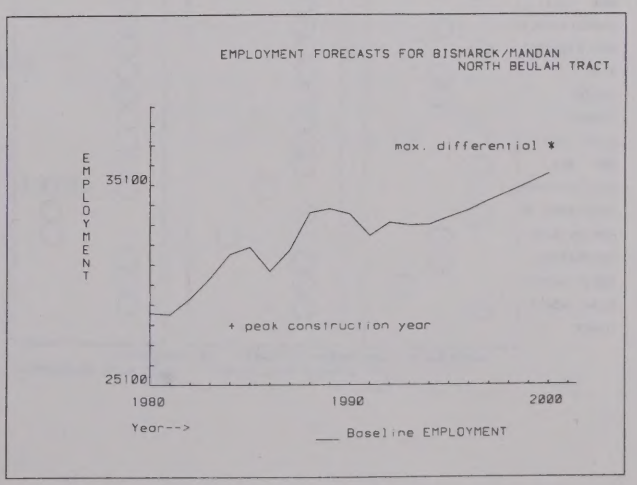
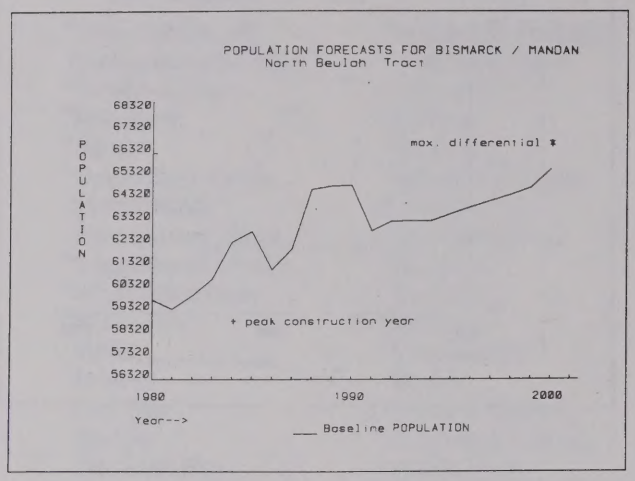


FIGURE 1 (continued)



SOURCE: Respective city/county or regional planners.

The vast majority of the Indianhead Mine (of which the North Beulah Tract is associated) employees currently reside in Beulah, Hazen, Zap, Bismarck, and Mandan (Waldrun, personal communication). The present (1981) condition of public services in the five communities is shown in Figure 2.

The adequacy ratings in Figure 2 reflect assessments by city and county planners. It should be recognized that some assessments were based on best judgment and are somewhat subjective.

FIGURE 2

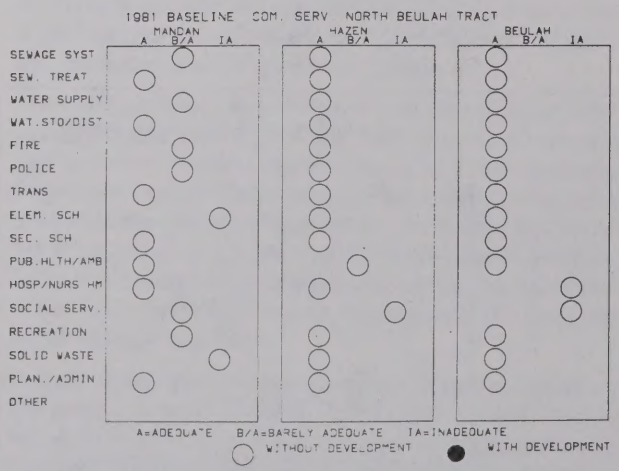
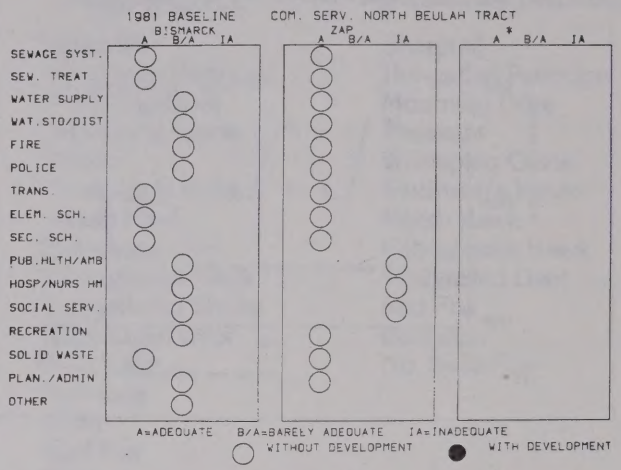


FIGURE 2 (continued)



SOURCE: Respective city/county or regional planners.

CLIMATE AND AIR QUALITY

The climate of western North Dakota is typically continental, characterized by variable temperature and precipitation. The predominant pressure systems, out of the Gulf of Mexico and the Arctic, account for the rapid alterations of meteorological conditions common to the area. Cold polar air masses dominate the winter months, while moist Gulf air masses prevail in the spring and summer, distributing the major precipitation across the area.

Meteorological data are available from surrounding stations are shown in Tables 6 and 7. The North Beulah Tract is located north of the meteorological station at Beulah and within the National Weather Service (NWS) West Central Region will be used to establish the tract's benchmark climatology.

The annual mean temperature for the area is 41°F with a highest monthly mean temperature of 69°F (in July), and a lowest monthly mean temperature of 8°F (in January). The average growing season is approximately 121 days; the last spring freeze generally occurs during the third week of May, while the first fall freeze generally occurs during the third week of September (Ramirez, J.M. and T. Method 1976).

Precipitation in the area occurs predominately in the late spring and early summer (May to July). Annual precipitation averages 17.20 inches at Beulah, and 16.91 inches through the NWS West Central Region. The average annual snowfall at Beulah is 27 inches.

TABLE 6*
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Beulah	Center	Washburn	Dunn Center	Bismarck (WSO)	NWS West Central Region
Temperature, ^{o}F						
$\bar{X}$ annual, ^{o}F	40.6	40.5	41.9	40.2	41.4	40.6
$\bar{X}$ monthly low (Jan)	7.6	8.5	8.2	7.9	8.2	8.4
$\bar{X}$ monthly high (July)	69.3	69.0	70.8	68.7	70.8	69.4
Average growing season (temp. 32° F), days	121	117	133	122	133	120
Precipitation, in.						
Annual average	17.20	17.45	18.01	16.57	15.15	16.91
Monthly range	0.32-3.35	0.48-3.55	0.35-4.11	0.36-3.72		0.40-3.92
Annual snowfall	27	29.8	30	34	40	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					14.3	
Class D					56.4	
Class E, F					29.3	
Wind direction, (%)					W-NW(28)	
Wind speed, mph (% of time)					0-3.5 (4)	
					3.6-6.9 (13.4)	
					7-11.5 (30.5)	
					11.6-18.4 (39.1)	
					18.5-24 (11.3)	
					>24 (1.6)	
Average wind speed, mph					10.8	

*SOURCES:
Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Commerce 1948-1974; 1973; 1974; 1979.

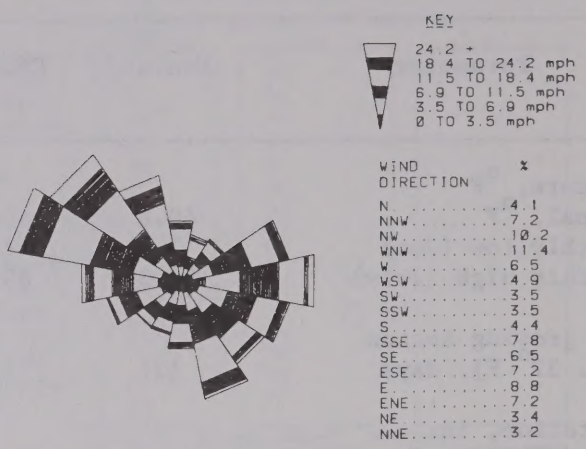
TABLE 7
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

*Recorded at Bismarck, North Dakota

Sources:
Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

FIGURE 3



WIND ROSE FOR BISMARCK NORTH DAKOTA

Wind data used for this analysis were obtained from the Bismarck climatological station, the nearest station to the tract with data suitable for input into the dispersion model. The wind rose in Figure 3 represents a summary of this data. Winds prevail from the WNW to NNW at Bismarck (29 percent frequency of occurrence). Wind speeds average 10.2 mph and exceed 11.5 mph 36 percent of the time.

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brum L. J., J. W. Enz and J. M. Ramirez 1978).

Table 8 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 15 ug/m^3 (at Garrison) to 32 ug/m^3 (at Beulah, rural). From 1974 to 1980 the annual geometric mean concentration of TSP at the Beulah residential monitoring station ranged from 28 to 61 ug/m^3. For the purpose of the following computer analyses, the background rural TSP levels will be set at 24 ug/m^3 for the annual level and 100 ug/m^3 for the 24-hour level.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO_2 increment for the South Unit of the Park is consumed, or nearly consumed.

TABLE 8
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m^3)	2nd Max. Observation (ug/m^3)	Annual Geom. Mean (ug/m^3)	Annual Arith. Mean (ug/m^3)
			State-Operated Sites:				
Beulah (rural)	74	TSP	10	488	47	26	69
	75	TSP	39	171	141	24	37
	76	TSP	51	81	61	24	29
	77	TSP	58	224	73	24	31
	78	TSP	52	288	258	32	52
	79	TSP	28	82	78	22	28
Beulah (residential)	74	TSP	32	1781	161	28	91
	75	TSP	48	151	126	34	41
	76	TSP	61	148	136	49	59
	77	TSP	58	290	149	45	55
	78	TSP	19	284	124	51	68
	79	TSP	45	214	197	51	67
	80	TSP	55	630	204	61	78
		SO_2	5517	104	73	<5	<5
Dunn Center (rural)	79	TSP	4	37	17	16	19
		SO_2	1896	78	26	13	13
	80	TSP	33	58	52	22	25
		SO_2	7332	52	39	<5	<5
Stanton (rural)	76	TSP	61	150	104	31	39
	77	TSP	60	237	90	24	32
	78	TSP	58	104	67	19	24
	79	TSP	42	90	80	19	25
			Privately-Operated Impact Source Monitoring Sites:				
Ramp #1 Beulah	79	TSP	11	161	93	57	69
		SO_2	1403	78	65	<5	<5
	80	TSP	59	642	125	24	41
		SO_2	6250	81	63	<5	<5
Ramp #2 Beulah	79	TSP	11	76	74	42	47
		SO_2	1401	73	52	<5	<5
	80	TSP	57	613	156	25	45
		SO_2	6251	91	84	<5	<5
Ramp #3 Beulah	79	TSP	11	1000	114	85	158
		SO_2	1403	47	39	<5	<5
	80	TSP	58	141	96	26	34
		SO_2	6239	148	107	<5	<5
Ramp #4	79	TSP	11	121	120	70	81
		SO_2	1403	102	63	<5	<5
	80	TSP	41	523	161	24	45
		SO_2	4141	165	151	<5	<5
Ramp #5	79	TSP	11	129	89	45	56
		SO_2	1404	37	31	<5	<5
	80	TSP	59	707	126	21	41
		SO_2	6164	60	57	<5	<5
Coteau #1	80	TSP	45	572	134	26	46
Coteau #2	80	TSP	41	700	308	49	80
Coteau #3	80	TSP	29	815	206	41	80

*SOURCE - NORTH DAKOTA STATE DEPARTMENT OF HEALTH

CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour of the land would be modified during surface mining. Although most would be returned to its approximate original contour, difference in detail would remain, including drainage patterns and final sloped highwalls.

GEOLOGY AND MINERALS

The major impact of the leasing alternative would be the removal of 43.4 million tons of coal. A total of 6.4 million tons of federal coal would be removed. Mineral resource conflicts could not occur between the development of oil and gas and coal.

SOILS AND RECLAMATION POTENTIAL

The types of impacts affecting the soil resource in this area have previously been discussed in Bureau of Land Management planning efforts and the Draft West-Central North Dakota Regional Environmental Impact Study. Briefly, the basic impacts are the disruption of the present soil bodies with temporary loss of productivity, in addition to problems associated with soil removal, replacement, erosion, and instability.

Stripping of suitable soil material on the steep slopes which are common in the tract may be difficult. Extra care would be required to operate removal equipment to maximize the amount of suitable soil that is saved. Control of surface runoff could be very important during this time to avoid soil loss by erosion and sedimentation problems in the drainageways.

Some instability problems would probably appear with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion or piping may occur (Groenwald, 1980). If the required stipulations governing the handling of soils and overburden during surface mining operations are closely adhered to and enforced, however, instability impacts should be kept minimal.

The soils would be lost to the production of grass, forage, and grain over the short-term (about 10 years for each annual disturbance of 87 acres). This loss would occur only on the active portion of the mine at any given time. Once in full operation, the total area out of production in any peak mining year is estimated at 870 acres. Soils would be continuously replaced on mined out areas and brought back into production during the life of the mine (40 years).

Preliminary indications from completed and ongoing research by such agencies as the Science and Education Administration—Agricultural Research of Mandan, North Dakota and North Dakota State University—Agricultural Experiment Station of Fargo are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementation of a concerted reclamation effort (Power 1974). This would be especially important for the North Beulah tract because the extensive steep slopes would make mining and reclamation quite difficult and expensive. Successful return of agricultural productivity in this tract should be possible. Soils Table 2 in Chapter 2 indicates that individual landowners have sufficient supplies of soil rated "good" and "fair" for use as cover soil material in surface mine reclamation. Two of the three core drill holes in the tract indicate that the upper fifty feet of some of the overburden is suitable plant growth material. This could add to the amount of soil material, which, if averaged over those areas rated "poor," might increase the overall productivity of the land.

HYDROLOGY

During the time that an area is being mined, all of the surface runoff from the disturbed area must be impounded and not released until it meets specified quality standards. An exception to this would be when storm runoff exceeds the design capacity of the reservoir. Water that collects in open mine pits is also often pumped into these surface water reservoirs. While these runoff catchment basins are in place, total water yields would be decreased due to increased evaporation and infiltration at the reservoirs. Stream flow in the ephemeral channels on and immediately adjacent to this tract would be decreased such that some stockwater ponds would have their water source diminished.

Water which would be released from the impoundments would generally have less suspended solids, higher dissolved solids, and higher sodium adsorption ratios. At this time, it is impossible to predict exactly how much difference there would be in the water quality.

There are no known ground water uses that would have their water source degraded.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 87 acres per year from its current uses. The major use of these lands is agricultural production. The first land taken out of agricultural operations, except for the ancillary facilities, would occur in the first year of mining. The time period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 40 year period.

Mining of any one location would be the land use for one to five years, depending on the type of mining. Land reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Service Commission agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would occur during the first appropriate season after grading to topography and replacing topsoil.

The company would be under bond for at least ten years to as long as necessary to prove, at a 90 percent confidence level, that agricultural productive capacity has been restored to equal or better than it was before mining (North Dakota Public Service Commission, Reclamation Department, 1980). Reclamation research by such agencies as the Science Education Administration—Agricultural Research Service and North Dakota State University—Agricultural Experiment Station indicates that some degree of optimism for the restoration of land to agricultural production is justified, although there is no certainty as to how long it would be before all mined land would be judged as fully restored as the law requires.

The leasing and development alternative would have a significant short-term impact on individual agriculture operations in the tract. By the end of the 40 year mine life, 3,475 acres of the tract would be disturbed, in addition to 160 surface acres used for existing mine facilities.

An average of 10 acres of cropland, excluding 287 total acres of summer-fallow, would be removed from production each year. This would be an average annual loss of 250 bushels of wheat. This 10 acres of cropland would be out of production ten years with a maximum of 104 acres out of production in any one peak mining year, resulting in a maximum loss of 2,600 bushels of wheat annually.

Peak mining year disturbance of 30 acres of hayland would result in an annual loss of 40 tons of hay production.

An average of 67 acres of rangeland would also be removed from production each year, resulting in an average loss of 33 AUMs. This 67 acres of rangeland would be out of production ten years with a maximum of 664 acres out of production in any one peak mining year, resulting in a maximum annual loss of 332 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated the Bureau of Land Management's doing agricultural data collection on the preliminary logical mining unit instead of the later final logical mining unit. The data may not completely represent the logical mining unit in its final form.

In reestablished native-type range it is likely that some introduced species would be used. The law requires that introduced species be of the same seasonal variety and of equal or superior utility as the native species. Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have difficulty in becoming established on some of the less suitable soils.

Forbs, woody plants, and trees (woodlands) must be reestablished along with grasses.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Existing use would be displaced during active mining and reclamation operations for a period of about 10 years.

Highways, county roads, transmission lines and farmsteads would be either bypassed or relocated as required by federal and North Dakota State laws.

Mine roads and storage sites and other mine facilities would be required during the life of the mine which may require additional acreage near the project area. Existing uses in this area would be displaced. Land must be reclaimed after the mine operations have been completed and the land reclaimed for its present use or another higher use if so desired by the surface owner. This implies that impacts are not irreversible and are short-term if legal requirements are met, ranging from 10 years to the completion of the mine operation.

There could be a need for some additional land for residential use but this would not be significant. There would be no long-term adverse impacts if the proposed reclamation was successful.

RECREATION

Habitat destruction and the resulting loss of wildlife species (deer, upland game birds, waterfowl) would damage recreational hunting. From the recreation perspective, it is likely the loss would be manageable.

Social and economic studies have documented demographic changes resulting from mining that would stress Garrison, North Dakota, and other communities in the vicinity of the tract. This stress would be felt on the available recreation facilites in the communities. Outside of the communities increased pressure would be seen on private and public land because of recreational opportunities lost to mining.

AESTHETICS

Mining would temporarily become a part of the view from Beulah and would influence the desirability of residential housing facing north, particularly from the south side of the town. A moderately scenic view forming a backdrop to the town would become of negligible or negative aesthetic value. A premium is not placed on lots with views to the tract area at the present time, but the change to the setting for the town of Beulah may influence some individuals' willingness to buy particular houses. Mining in the tract area would represent a loss of aesthetic and scenic area. In that badlands are attractive because of the structure of the erosional patterns, this loss would be irreversible and irretrievable.

WILDLIFE

Coal mining and attendent actions would severely disrupt and destroy significant native prairie interspersed with woodlands and wetlands, which singly and in composite, constitute the essential habitats for 31 sensitive wildlife species in the area, and many other more common wildlife (Map 3, Chapter I). The farmed land totaling 28 percent of the area provides no essential habitat for wildlife, although it is used by numerous wildlife throughout the year.

On-site effects to wildlife resources would be degradation and loss of the three essential habitats. Offsite aquatic habitats in the Knife and Missouri Rivers would be the recipient of potential point and non-point pollution.

There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands, and native prairie.

Mobile wildlife, such as birds and large mammals, may shift about the habitat losses to some degree, but non-mobile species, such as reptiles and amphibians, would be destroyed. The very limited availability and disruption of riparin woodlands and wetlands would restrict, and in many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust and affiliated disturbances cumulatively may cause wildlife to vacate unmined habitats and may preclude adoption by wildlife of those rehabilitated areas until the disturbances are eliminated. This may be for the life of the mine and rehabilitation period, maybe as long as 40 or more years.

Increased human populations resultant of mine development and operations generally reduce wildlife populations and habitat locally and offsite by poaching, road kills, increased legal harvest, disturbance or reproductive and migratory periods and habitats, harassment by recreationists, feral and uncontrolled cats and dogs, degradation and complete loss of habitat due to housing, shopping, waste treatment, services, and similiar urban development. The problem is compounded in areas where shift changes of workers coincide with wildlife feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts available to entities other than BLM, would be to provide mass transportation of workers and adjust the times of shift changes which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement or adoption of a poaching clause in union contracts would also help.

Successful reclamation of native woodlands and natural wetlands such as "potholes" and riverine wetlands has not been demonstrated. Although some prairie plowed about 70 years ago and since left undisturbed has had some native plant reestablished, complete reclamation has not been achieved.

Concurrent reclamation of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the lessor negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands would be expected to become a permanent loss.

Natural, biologically viable wetlands (e.g., potholes) have not yet been reclaimed from mine spoil in this country. It would be most productive and conservative to eliminate mining from the larger wetlands (e.g., 1/2 acre and greater) thereby retaining the critical soil structure of the wetlands and eliminating the extended delay proposed for wetlands reclamation attempts. Destruction of natural viable wetlands by strip mining under the present state of biological and hydrological knowledge would be an irretrievable committment of wildlife resources.

An interagency team of wildlife biologists from the North Dakota Game and Fish Department, U.S. Fish and Wildlife Service and BLM have identified and recommended areas for the application of unsuitability criteria (Map 3. Chapter I). Formal recommendations have been received by BLM from the other agencies. Joint agreement between the agencies and final decisions on unsuitability, exemptions such as producing leases and exceptions, will be completed in August.

CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

Sites not directly impacted by earth disturbance may be impacted as a result of the earth disturbance. These secondary impacts can include vandalism increased by improved access and loss as a result of erosion or degradation resulting from disruption of natural setting.

In the event of lease, stipulations covering cultural resources would have to be developed. These stipulations would have to treat both recorded and unrecorded sites. They would also have to require management plans for cultural resources that detail mitigation plans for each site to be impacted. As in any cultural resources mitigation, preservation alternatives are preferred. If these options are not viable, then scientific data recovery programs would have to be developed.

ECONOMIC AND SOCIAL CONDITIONS

It is unlikely that the employment level of the mine would significantly change if the North Beulah Tract is leased. Without a change in mine employment the population level of the surrounding communities would remain stable. This would result in no additional impacts to community services or changes in social conditions.

The only effect of leasing on community services would be a continuation of the existing level of demand for these services for an additional 40 years (life of the mine). The present condition of public services in communities where existing mine employees reside is shown in Figure 2.

Technical reports are available which discuss the methodology used in the economic or social analysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 6,919 Btus. The ratio of energy produced to that expended is 184 Btus/1 Btu.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action cannot be addressed specifically. This is due to a lack of technical information and research work on the topic of potential impacts on climate. However, general climatic influences applicable to the proposed development can be discussed.

The modification of surface contours and albedo due to redistribution of soils and removal of vegetation may produce slight localized changes in wind speed and direction, temperature, and humidity. Impacts associated with the increased particulate emissions could also alter local climatic conditions. Reclamation with reestablishment of vegetation and a stable landscape should largely mitigate these impacts over the long-term.

The methodology for determining the air quality impact of particulate emissions consists of: 1) obtaining mine profiles for the tract from BLM; 2) obtaining emission factors for individual surface coal mining operations; 3) using the mine profile and emission factors for calculation of total emissions; 4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations; and 5) comparing predicted concentrations to Federal and State Ambient Air Quality Standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the proposed tract's peak production period.

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 9.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine would not be a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment (i.e., these sources do not have to meet PSD regulations, but the emissions from these sources are counted against PSD increment). Table 10 shows Federal and State PSD standards.

TABLE 9
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m^3	75 ug/m^3	60 ug/m^3	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m^3	260 ug/m^3	250 ug/m^3	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standard)			15 tons/ sq. mile	Max. 3-month arithmetic mean in residential areas
				30 tons/ sq. mile	Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m^3)	60 ug/m^3 (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		.14 ppm (365 ug/m^3)	260 ug/m^3 (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m^3)		715 ug/m^3 (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO_3/100 cm^2/day	Max. annual arithmetic mean
				0.50 mg SO_3/100 cm^2/day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic mean
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
				30 ug/m^3	Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 9 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m^3 (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m^3 (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	10 ug/m^3 (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m^3)	35 ppm (40 ug/m^3)	40 ug/m^3 (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	235 ug/m^3 (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm (160 ug/m^3)	.24 ppm (160 ug/m^3)	160 ug/m^3 (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm (100 ug/m^3)	.05 ppm (100 ug/m^3)	100 ug/m^3 (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m^3 (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m^3	1.5 ug/m^3	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

TABLE 10
FEDERAL AND STATE PSD STANDARDS

	Federal	State
Major Sources, subject to PSD review	100[1]	100[3]
(excludes fugitive dust emissions) (t/yr)	250[2]	250[4]
Major Sources, not subject to PSD review-counts against PSD increment	100[1]	100[3]
(considers fugitive dust emissions) (t/yr)	250[2]	250[4]
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean (ug/m^3)	5	5
24-hour maximum (ug/m^3)	10	10
Class II		
annual geometric mean (ug/m^3)	19	10
24-hour maximum (ug/m^3)	37	30
Class III		
annual geometric mean (ug/m^3)	37	37
24-hour maximum (ug/m^3)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean (ug/m^3)	2	2
24-hour maximum (ug/m^3)	5	5
3-hour maximum (ug/m^3)	25	25
Class II		
annual arithmetic mean (ug/m^3)	20	15
24-hour maximum (ug/m^3)	91	91
3-hour maximum (ug/m^3)	512	512
Class III		
annual arithmetic mean (ug/m^3)	40	40
24-hour maximum (ug/m^3)	182	182
3-hour maximum (ug/m^3)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC Requirement for Preparation, Adaption and Submittal of Implementation Plan. 1978. Title 40 CFR, Part 51.

During peak production of the mine an estimated 700 tons per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 97 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and NAAQS. Areas within the active mining area, such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

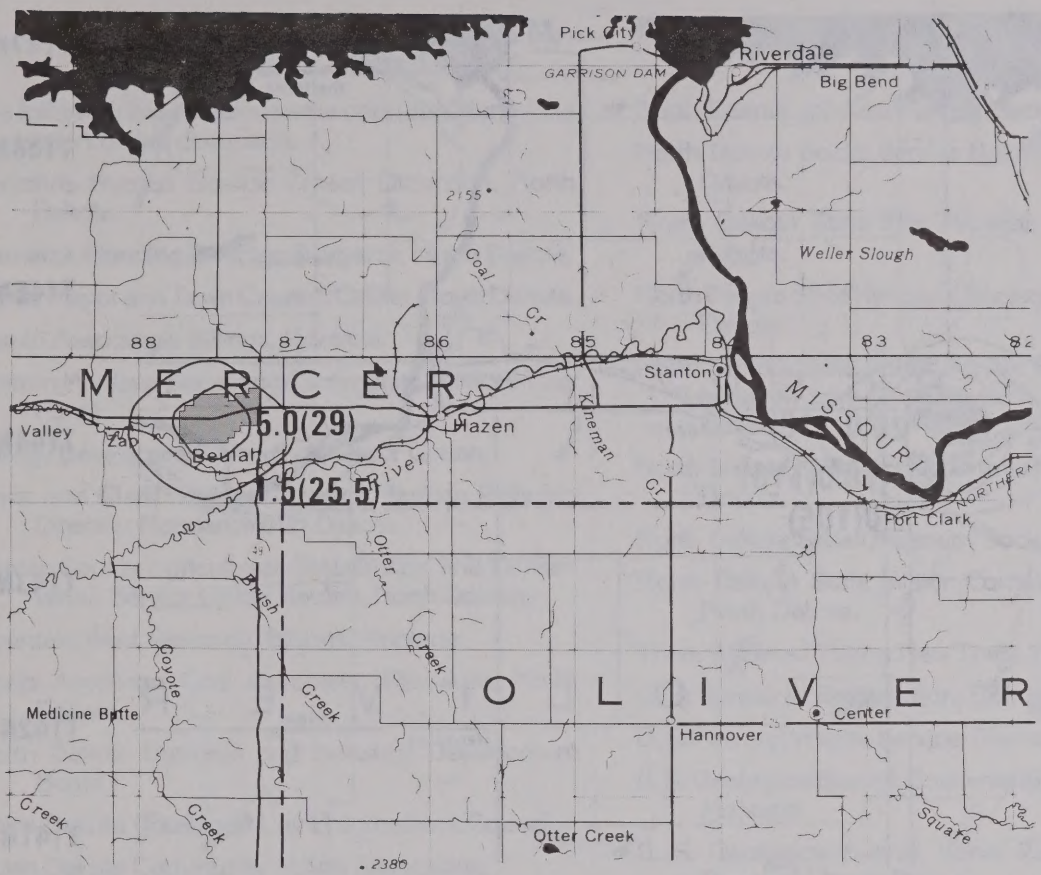
The isopleth lines on Figure 4 indicate annual average particulate concentrations that could result during peak production; the highest concentration at a location off the mine site could be 6.7 ug/m^3. This level would consume the allowable Class II PSD annual increment for particulates. With the annual background concentration added (24 ug/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 5 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 55 ug/m^3. This level would consume the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (100 ug/m^3), the ambient level would be 155 ug/m^3. This level exceeds the State Ambient Air Quality Standard and the Federal Secondary Ambient Air Quality Standard. A violation would occur if the ambient air standard was exceeded more than once per year. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this would be subject to the mine emissions and the corresponding background levels in the area.

Because the proposed action totally consumes the allowable Class II PSD increments for particulates, any associated PSD source could not contribute significantly (5 ug/m^3-24-hour) to the PSD's Class II annual or 24-hour particulates increment.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.



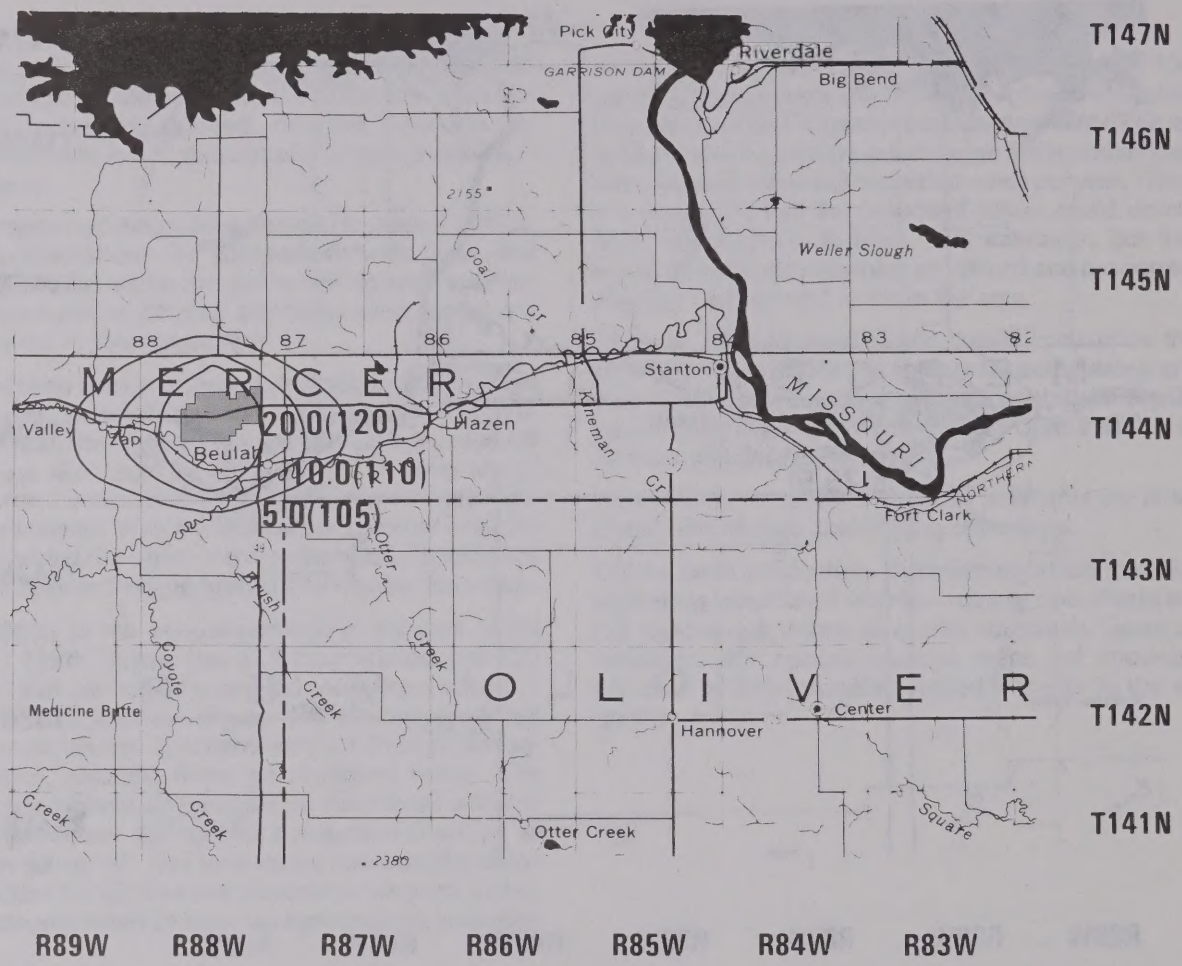
North Beulah Tract

N

TSP Annual Average Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 4



North Beulah Tract

N

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 5

CHAPTER IV
CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Bismarck Planning Director; Bismarck, North Dakota.

Center Mayor and Town Council; Center, North Dakota.

Cumin Associates; Billings, Montana.

Eastern Montana Social and Community Services Task Force.

Energy Development Board of Mercer County.

Lewis and Clark Regional Council Mandan Planning Director; Mandan, North Dakota.

Mercer County Agricultural, Stabilization and Conservation Service Office; Beulah, North Dakota.

Mountain West Research; Billings, Montana.

North American Coal Company; Bismarck, North Dakota.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshal; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

U. S. Bureau of Reclamation; Billings, Montana.

U. S. Fish and Wildlife Service, Bismarck, North Dakota.

U. S. Geological Survey, Conservation Divsion; Billings, Montana.

U. S. Geological Survey, Water Resources Division; Bismarck, North Daktoa.

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SUMMARY MATRIX
NORTH BEULAH TRACT
RESOURCE AND ENVIRONMENTAL CONSIDERATIONS

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Rolling to hilly	Less constrasting topography, slight modification of original drainage pattern.	Low	Good	
Geology and Minerals					
Geologic Hazards	None identified	None	N/A	Good	
Potential for Other Minerals	Low (oil and gas) - This tract is located in the Williston Basin.	Low - There has been ongoing exploration in the area.	Mining could interfere with development of the oil and gas.	Good	
Paleontological Resources	Low - None identified to date.	Will improve knowledge of the resources near the mine.	Low	Good	
Soils and Reclamation Potential					
Soil Erosion Potential	Moderater over much of tract.	Possible slight increase during soil handling operations and on areas being reclaimed to rangeland before reestablishment of vegetative cover.	Minimal	Outstanding	
Toxic Elements in Soil	No problems	No problems	None	There has not been a need for this data.	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Chemicals Corrosive to Metal or Concrete in Soil	Corrosivity of most soils to: Untreated steel - Moderate to High, Concrete - Low to Moderate.	No problems	None	Outstanding	Official soil series descriptions give corrosivity of each soil.
Highly Saline/ Sodic and Clayey Soil Conditions	Most all of the 24 tracts marked by an * in Table 2 are predominated by soils with these conditions.	Some areas excessively compacted even with mitigation. Individual landowner tracts with small acreage of sodic, clayey soils improved by replacing with better soil. Those predominated by the sodic, clayey soils are difficult and expensive to reclaim.	Minimal with enough time, money and effort put into working with the soil.	Outstanding	
Character of Subsurface Materials and/or Interburden	Composed primarily of shales and sandstone. Most of material probably fine textured, highly alkaline and sodic.	Some instability problems (settling, piping) may appear after reclamation.	Minimal	General knowledge of type of material, etc., outstanding. Specific chemical data on interburden, within tract -. unsatisfactory.	Several core drill holes with chemical data 5 miles north of tract indicate fine textured overburden with high pH and sodium.

Reclamation Potential

Based on the soil suitability for final cover of surface mined land, the chances for successful reclamation by individual landowner and for the tract as a whole appear to be high. However, the steep slopes over this tract will probably make the entire mining process, including reclamation, quite expensive. The soil suitabilities are: Good - 1,287 acres, 37%; Fair - 1,761 acres, 50%; and Poor - 472 acres, 13%. Some of the top portion of the overburden might be used to improve areas rated "poor". Precipitation could be a limiting factor for reestablishing vegetative cover some years.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Hydrology					
Degradation of Groundwater Quality	Groundwater currently used for domestic and livestock purposes.	No degradation expected on	Low	Acceptable	
Vegetation					
Cropland	There are 362 acres of land in the tract that are currently being cropped.	Average annual loss of 10 acres excluding 287 total acres of summer fallow. Annual production on this 10 acres would be 250 bu. of wheat. Maximum loss in any one peak mining year would be 104 acres and 2600 bu. of wheat.	Moderate to high, depending upon individual operation. Low to moderate for overall tract production.	Outstanding	
Rangeland	Average annual production is 1,328 AUMs.	Average annual loss of 33 AUMs. Each acre would be out of production for 10 years. Maximum loss for any one peak mining year would be 664 acres and 332 AUMs.	Moderate to high, depending upon individual operation. Low to moderate for overall tract.	Outstanding	
Agriculture	There are 7 operators in the tract.	The same number of operators would be affected, to varying degrees, by a long term but temporary loss of acreage for agricultural production.	Very significant to the the operators involved.	Outstanding	
	22% of the involved operators' acreage is in the tract.			Outstanding	
	51% of the acreage in the tract is operated by lessees.	Nonowners would lose the use of their leased acreage with no compensation.	Significant to nonowners.	Outstanding	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Land Use	Agriculture, coal mining, local roads and utility lines, and State Highway 200.	Temporary displacement of existing agricultural use. Relocation or bypass of existing roads and utilities.	See Vegetation and Agriculture sections. Temporary inconvenience.	Acceptable	
Threatened or Endangered Species	None	None	None	Good	
Recreation Values	Less than 5% of the tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts significant.	Good - Based on current studies.	
Aesthetics	Badlands influenced by agriculture. High visual quality and moderate scenic value.	Permanent loss of visual character through modification of land forms. Permanent loss of visual amenity though this type of scenery is not common in this area. Short term loss of visual amenity.	Moderately significant.	Acceptable	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Wildlife					
Sensitive Wildlife and Essential Habitats	Sensitive wildlife habitat - 30-70% of the areas for 30 sensitive wildlife species. Whooping crane and northern swift fox are identified with the area.	Coal mining and attendent actions would severely disrupt and destroy locally significant wetlands and woodlands interspersed with native prairie which singly and in composite constitute the essential habitats for 30 sensitive wildlife and many more common wildlife. Offsite aquatic habitats of Otter, Coyote, Brush, Spring Creeks and the Knife and Missouri Rivers, and the Garrison Reservoir would be recipients of potential point and non-point pollution.	There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy and Land Use Team. Unsuitability Criteria Application Team (FWS, NDGP, and BLM biologists). Wildlife data quality is high.	To date there are no data to direct successful recreation (compensation) native woodlands and wetlands after strip mining in this country. Native prairie comprised of native plant species has not been recreated from mine spoil. If some forms of habitat replacement is achieved during mining and thereafter, then the negative impacts to wildlife resources would be proportional to the successful compensation.
General					Increased poaching and disturbance would significantly reduce all wildlife populations in the region. If not controlled it would significantly reduce recreation opportunities.
Cultural/ Historical Values	Sample surveys are complete. Recorded cultural resources would not affect coal mining.	Loss of sites as a result of mining activity.	Anticipated impact is not great because resources could be mitigated through data recovery.	Good	None

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Net Energy Analysis	No fossil fuels are being produced from this tract.	A total of 1.1 million tons of coal (0.2 million tons of federal coal) would be produced annually.	Production: 6919 Btu/lb. of coal Consumption: 37.7 Btu/lb. of coal Ratio of production to consumption: 184:1	Acceptable	
Climate and Air Quality	Good	Totally consumes the allowable class II PSD 24-hour increment for particulates.	Significant	Fair	Any associated PSD source could not contribute significantly ($5ug/m^3$ - 24-hour) to the PSD's class II 24-hour particulates increment.
		Social and Economic Considerations			
Employment	Community services generally adequate for current employment site.	Very small if any increase in employment.	Insignificant	Acceptable	
Population	Community services generally adequate for current population.	Very small if any increase in population.	Insignificant	Acceptable	
Regional Income	$4560 estimated regional income per capita.	Very small if any increase in regional income per capita.	Insignificant	Acceptable	
Infrastructure Assessment (Community Services)	Most community services generally adequate; often with one or two inadequate services.	No change in community service adequacy.	Insignificant	Acceptable	

NORTH BEULAH TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	No	---	No	---
2. Rights-of-way and easements	No	---	No	---
3. Buffer zones	Yes	No	No	Exceptions may be applied at mine plan.
4. Wilderness study areas	No	---	No	---
5. Scenic areas	No	---	No	---
6. Land used for scientific studies	No	---	No	---
7. Historic lands and sites	No	---	No	---
8. Natural areas	No	---	No	---
9. Federally listed endangered species	Yes, Whooping crane and northern swift fox known or believed to use these regions.	---	Swift fox data very limited.	Exclusion of strip mining from wetlands would protect most whooping crane areas.
10. State listed endangered species	No	---	No	Does not exist.
11. Eagle nests	No	---	No	---

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
12. Eagle roosts and concentration areas	No	---	No	---
13. Falcon cliff-nesting sites	No	---	No	---
14. Migratory birds	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	Seven species in combination with Criterion 15.
15. State resident fish and wildlife	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	About 30 species in combination with Criterion 14.
16. Flood plains	No	---	No	---
17. Municipal watersheds	No	---	No	---
18. National resource waters	No	---	No	---
19. Alluvial valley floors	No	---	No	---
20. State proposed criteria	No	---	No	---

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